
CHAPTER III

Development of Alternative Plans



U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
MID-PACIFIC REGION

CHAPTER III

DEVELOPMENT OF ALTERNATIVE PLANS

A. PLAN FORMULATION

Each refuge has its own unique set of problems and needs. Some of the refuges need additional water during the fall and winter. Other refuges need better quality water than is currently provided. Most of the refuges currently rely upon intermittent water supplies, agricultural return flows, or run-off available only during wet weather periods.

To develop alternatives for dependable water supplies, the study team members met with wildlife managers and representatives of local water and irrigation districts. Based on discussions, field review, and specific problems, potential alternatives were developed for each refuge for different water supply levels. Water delivery Level 1 is the existing firm water supply that is provided through surface water rights or long-term water contracts. Water delivery Level 2 represents the current average annual water delivery based on the past ten years. Level 3 represents the amount of water needed for full use of the existing developed lands on the refuge. Level 4 represents the amount of water that wetland managers deem necessary for optimum management of all lands within the existing refuge boundary.

The No Action Alternative is the Level 1 alternative and does not require any additional facilities or deliveries. Generally, new or enhanced facilities are not required to meet Level 2. However, Level 2 alternatives were developed for several of the refuges because some of the existing water supplies may not be available in the future, or due to poor water quality the existing water supplies need to be replaced.

Following the identification of alternatives, the study team members again met the refuge wildlife managers and representatives of the water and irrigation districts to determine the available capacity of the existing conveyance facilities, the potential for extending the water conveyance season to accommodate fall and winter deliveries to the refuges, the acceptability of the proposed improvements to the water and irrigation districts, the potential for conveyance agreements, and the local costs for similar types of construction. Through this process, alternatives were modified and added for each refuge. The alternatives for each refuge are described in Chapter IV and summarized in Table III-1.

With Level 1, The No Action Alternative, only seven of the fifteen refuges have existing water rights or long-term water contracts, and only Modoc National Wildlife Refuge holds water rights for more than 50 percent of the water supply deemed

TABLE III-1
SUMMARY OF PROPOSED DELIVERY ALTERNATIVES

Refuge	Level 1	Level 2	Level 3	Level 4
Modoc NWR	None	A. Conjunctive Use	A. Conjunctive Use	B. Rehabilitate Dam on Pit River C. Construct Wells
Sacramento NWR	None	A. Construct Flood Gate on GCID Main Canal B. Deliver CVP Water through Kanawha WD C. Construct Pipeline to Transport CVP Water from Tehama-Colusa Canal to GCID Lateral 26-2. D. Deliver CVP Water from Tehama-Colusa Canal to GCID Lateral 35-1C E. Develop Well Field	A. Construct Flood Gate on GCID Main Canal B. Deliver CVP Water through Kanawha WD C. Construct Pipeline to Transport CVP Water from Tehama-Colusa Canal to GCID Lateral 26-2 D. Deliver CVP Water from Tehama-Colusa Canal to GCID Lateral 35-1C E. Develop Well Field	A. Construct Flood Gate on GCID Main Canal B. Deliver CVP Water through Kanawha WD C. Construct Pipeline to Transport CVP Water from Tehama-Colusa Canal to GCID Lateral 26-2 D. Deliver CVP Water from Tehama-Colusa Canal to GCID Lateral 35-1C E. Develop Well Field
Delevan NWR	None	None	A. Construct Cross-Over Ditch on GCID Lateral 41-1 B. Improve Hunters Creek No. 2 Weir C. Conjunctive Use	D. Construct Pump Station on 2047 Drain E. Construct Siphons Under Maxwell ID Canal
Colusa NWR	None	A. Construct Weir on 2047 Drain B. Improve Davis Weir C. Conjunctive Use D. Water through Zumwalt Farms	A. Construct Weir on 2047 Drain B. Improve Davis Weir C. Conjunctive Use D. Water through Zumwalt Farms	E. Improve Conveyance for Tracts 4, 7, 9, and 11

TABLE III-1
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Refuge	Level 1	Level 2	Level 3	Level 4
Sutter NWR	None	<p>A. Deliver Water from Thermalito Afterbay through Beetle Creek.</p> <p>B. Deliver Water from Thermalito Afterbay through Wadsworth Canal</p> <p>C. Obtain Water from Sutter Extension Water District</p> <p>D. Conjunctive Use</p>	<p>A. Deliver Water from Thermalito Afterbay through Beetle Creek.</p> <p>B. Deliver Water from Thermalito Afterbay through Wadsworth Canal</p> <p>C. Obtain Water from Sutter Extension Water District</p> <p>D. Conjunctive Use</p>	<p>A. Deliver Water from Thermalito Afterbay through Beetle Creek.</p> <p>B. Deliver Water from Thermalito Afterbay through Wadsworth Canal</p> <p>C. Obtain Water from Sutter Extension Water District</p> <p>D. Conjunctive Use</p>
Gray Lodge WMA	None	<p>A. Construct Ditch from Cherokee Canal</p> <p>B. Construct Canal from Thermalito Afterbay</p>	<p>A. Construct Ditch from Cherokee Canal</p> <p>B. Construct Canal from Thermalito Afterbay</p> <p>C. Improve BWGID System</p>	<p>A. Construct Ditch from Cherokee Canal</p> <p>B. Construct Canal from Thermalito Afterbay</p> <p>C. Improve BWGID System</p>
Grassland Resource Conservation District	<p>A. Change Operation of Mendota Pool</p> <p>B. Convey Water Under the Zahm-Sansoni Plan</p> <p>C. Utilize the Wolfson Bypass</p>	<p>A. Change Operation of Mendota Pool</p> <p>B. Convey Water Under the Zahm-Sansoni Plan</p> <p>C. Utilize the Wolfson Bypass</p>	<p>D. Construct Turnout on Delta-Mendota Canal at Almond Drive</p> <p>E. Construct Turnout on Delta-Mendota Canal at Russell Avenue</p> <p>F. Implement a Conjunctive Use Plan</p>	<p>D. Construct Turnout on Delta-Mendota Canal at Almond Drive</p> <p>E. Construct Turnout on Delta-Mendota Canal at Russell Avenue</p> <p>F. Implement a Conjunctive Use Plan</p>
Volta Wildlife Management Area	<p>A. Construct Turnout in Main Canal</p> <p>B. Implement a Conjunctive Use Plan</p>	<p>A. Construct Turnout in Main Canal</p> <p>B. Implement a Conjunctive Use Plan</p>	<p>C. Construct Turnout at Main Canal and Upgrade Outtakes</p>	<p>C. Construct Turnout at Main Canal and Upgrade Outtakes</p>

TABLE III-1
SUMMARY OF PROPOSED DELIVERY ALTERNATIVES

Refuge	Level 1	Level 2	Level 3	Level 4
Los Banos Wildlife Management Area	A. Convey Water Under the Zahm-Sansoni Plan B. Implement a Conjunctive Use Program C. Reconstruct SLCC Facilities	A. Convey Water Under the Zahm-Sansoni Plan B. Implement a Conjunctive Use Program C. Reconstruct SLCC Facilities	A. Convey Water Under the Zahm-Sansoni Plan B. Implement a Conjunctive Use Program C. Reconstruct SLCC Facilities	A. Convey Water Under the Zahm-Sansoni Plan B. Implement a Conjunctive Use Program C. Reconstruct SLCC Facilities
Kesterson National Wildlife Refuge	A. Convey Water Under the Zahm-Sansoni Plan B. Extend Eagle Ditch into Refuge C. Extend West Side Ditch to Eagle Ditch D. Convey Water from Garzas Creek to Los Banos Creek	A. Convey Water Under the Zahm-Sansoni Plan B. Extend Eagle Ditch into Refuge C. Extend West Side Ditch to Eagle Ditch D. Convey Water from Garzas Creek to Los Banos Creek	E. Utilize Mud Slough	F. Extend Santa Fe Canal
San Luis National Wildlife Refuge	None	A. Convey Water Under the Zahm-Sansoni Plan B. Line SLCC Ditches C. Construct Lift Pumps to Utilize San Joaquin River Water D. Implement a Conjunctive Use Plan	A. Convey Water Under the Zahm-Sansoni Plan B. Line SLCC Ditches C. Construct Lift Pumps to Utilize San Joaquin River Water D. Implement a Conjunctive Use Plan	A. Convey Water Under the Zahm-Sansoni Plan B. Line SLCC Ditches C. Construct Lift Pumps to Utilize San Joaquin River Water D. Implement a Conjunctive Use Plan

TABLE III-1
SUMMARY OF PROPOSED DELIVERY ALTERNATIVES

Refuge	Level 1	Level 2	Level 3	Level 4
Merced National Wildlife Refuge	A. Utilize the East Side Bypass	A. Utilize the East Side Bypass	B. Extend Casebeer Lateral to Refuge Boundary C. Extend Casebeer Lateral to Deadman Creek D. Implement a Conjunctive Use Plan E. Utilize Treated Waste-water from the Merced Treatment Plant	B. Extend Casebeer Lateral to Refuge Boundary C. Extend Casebeer Lateral to Deadman Creek D. Implement a Conjunctive Use Plan E. Utilize Treated Waste-water from the Merced Treatment Plant
Mendota Wildlife Management Area	A. Change Operation of Mendota Pool B. Supply Water from Westlands Irrigation District C. Construct Wells for Use in Conjunction with Surface Supplies	A. Change Operation of Mendota Pool B. Supply Water from Westlands Irrigation District C. Construct Wells for Use in Conjunction with Surface Supplies	B. Supply Water from Westlands Irrigation District	B. Supply Water from Westlands Irrigation District
Pixley National Wildlife Refuge	None	None	A. Utilize Friant-Kern Canal Water via Deer Creek B. Utilize Mid-Valley Canal Water via Deer Creek C. Utilize Federal Water via the California Aqueduct	A. Utilize Friant-Kern Canal Water via Deer Creek B. Utilize Mid-Valley Canal Water via Deer Creek C. Utilize Federal Water via the California Aqueduct

TABLE III-1
SUMMARY OF PROPOSED DELIVERY ALTERNATIVES

Refuge	Level 1	Level 2	Level 3	Level 4
Kern National Wildlife Refuge	None	None	<p>A. Transport Federal Water through the BVWSD Facilities</p> <p>B. Transport State Water through the Lost Hills Water Storage Facilities</p> <p>C. Transport Federal Water through the Friant-Kern Canal and Paso Creek</p> <p>D. Implement a conjunctive Use Plan</p>	<p>A. Transport Federal Water through the BVWSD Facilities</p> <p>B. Transport State Water through the Lost Hills Water Storage Facilities</p> <p>C. Transport Federal Water through the Friant-Kern Canal and Paso Creek</p> <p>D. Implement a conjunctive Use Plan</p>

necessary for optimal wetland management which is of an adequate quality. Therefore, under the No Action Alternative, eight refuges would not receive firm water and six refuges would not receive adequate supplies of dependable water. Currently, many of the refuges receive supplemental water either not contracted for under long-term agreements, or from agricultural return flows. However, following the completion of the Water Contracting EIS's, the uncontracted water may be delivered elsewhere under long-term agreements. In addition, water conservation methods may be implemented in the future which will reduce the amount of agricultural return flows available to the refuges.

B. PLAN EVALUATION AND SELECTION CRITERIA

As part of this report, plans were developed for each water supply level. The plans were evaluated with respect to many factors, including:

- o Availability of Water Supply
- o Ability to Convey Water
- o Need for New Water Supply
- o Need for New Conveyance Agreements
- o Type of Water Supply (Fresh Water, Groundwater, or Agricultural Return Flows)
- o Operational Flexibility
- o Wildlife Habitat
- o Public Use
- o Total Annual Costs
- o Impacts to Fish and Wildlife Resources

The alternative plans will be evaluated as part of the Water Contracting EIS'S. The evaluation will include site specific and regional analyses. The results of the evaluation will be used to determine the actual water supply level that will be available to each refuge.

Reclamation has requested that the Service provide refuge water priorities on a system basis. This information will be considered in the plan development stage for refuges within the Sacramento and San Joaquin Valleys.

1. Economic Analyses

The benefits derived from recreation opportunities were based upon consumptive and non-consumptive uses created as a result of providing the wildlife refuges alternate water supplies. NWR'S and WMA'S are unique areas that are intensively managed as waterfowl feeding and resting sites. Areas are also specifically set aside within the NWR'S and WMA's for hunting and are managed particularly for that purpose. Hunting is allowed only on desig-

nated days, with a regulated number of hunters. As a result of this type of management and a lack of available land with public hunting access, these public shooting areas are highly valued and heavily used. Consequently, a high quality, specialized type of recreation experience can be obtained at these refuge areas.

In light of these facts and considering the five criteria for assigning points for specialized recreation, it was determined that the experience afforded the public on the NWR's and WMA's was of a specialized nature and of high quality. Therefore the recreation benefits were calculated using the \$21.66 value as outlined in the principals and guidelines for recreation unit day values furnished by the Engineering and Research Center (E&RC).

In addition to consumptive recreation activities, non-consumptive recreation activities such as bird watching may be expected to occur at the wildlife refuges. These specialized non-consumptive recreation unit day values were also estimated at \$21.66 using the updates furnished by the E&RC since specific studies were not available.

2. Environmental Analyses

The alternatives considered in this study primarily involve construction of weirs, turnouts, pumps, connecting canals, and wells. Most of these facilities would be constructed in or near existing canals and ditches which are periodically cleaned by the local irrigation districts. The connecting canals would mostly be constructed across currently tilled areas. Therefore, the site specific impacts would be limited. The regional impacts and the impacts of providing water to the refuges as compared to other potential water users will be evaluated in the Water Contracting EIS's.

All of the selected alternative plans would benefit waterfowl at the refuges, as discussed in Chapter IV and in the Environmental Appendix. Listed and candidate, threatened and endangered species are presented for each refuge in Chapter IV. Additional water would benefit waterfowl and riparian species. However, flooding of upland areas for some of the refuges under Water Delivery Level 4 may adversely impact habitat for some upland plants. The alternative plans that would allow longer seasons for water conveyance by the local irrigation districts may also maintain riparian habitat along the unlined conveyance canals.

3. Social Analyses

The social analyses are primarily related to regional impacts of providing water to the refuges as compared to other water users. Other social impacts are related to increased public use and construction of the selected plans. Public use will increase under most of the alternative plans, however, the increase is not anticipated to be significant. Similarly, the construction activities would be relatively small and would probably be completed within one season. The local social setting for areas in the vicinity of the refuges is presented in the Social Appendix.